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PACIFIC SALMON COMMISSION
JOINT CHINOOK TECHNICAL COMMITTEE
1987 ANNUAL REPORT

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EXECUTIVE SUMMARY

1987 CHINOOK SALMON CATCHES IN FISHERIES WITH CEILINGS

Estimates of 1987 catch for each fishery managed under a harvest ceiling established by the Treaty are presented below. These data are preliminary, but major changes are not expected.

(Compiled with information available as of Oct.10,1988)
(numbers x 1,000)

AREA AND FISHERY	CEILING	CATCH	DIFFERENCE #'s	DIFFERENCE %
SE Alaska (T,N,S) a/ b/	279	282	3.0	+1.1
North/Central B.C. (T,N,S)	263	283	20.0	+7.6
West Coast Vancouver I. (T)	360	378.9	18.9	+5.3
Georgia Strait (T,S)	275	159.7	-115.3	-41.9

a/ T=Troll; N=Net; S=Sport
b/ 263,000 base plus 16,000 hatchery addon.

Catches in fisheries of interest to the Pacific Salmon Commission are documented in Table 1. The catch in northern B.C. is at the limit of the 7.5% management range about the catch ceiling established by the Commission.

CHINOOK TECHNICAL COMMITTEE CONCLUSIONS

The following conclusions are based on the Committee's analyses of spawning escapements through 1987 (Appendix I) and exploitation rates in fisheries and indicator stocks (Appendix II). Escapement assessments are based on 43 stocks or stock groupings used to represent trends in the spawning escapement of naturally spawning chinook stocks. These escapement indicators are distributed across geographic areas and run timings of spawning migrations:

Area	Spring	Spring/ Summer	Summer	Summer/ Fall	Fall	Total
S.E. Alaska	5					5
Transboundary	6					6
Northern B.C.		4	3			7
Southern B.C.		3		1	3	7
WA/OR	3	2	2	3	8	18
Total	14	9	5	4	11	43

These escapement indicator stocks usually differ from the exploitation rate indicator stocks. The latter stocks must have a time series of coded-wire tag data extending prior to the Treaty. Exploitation rate indicators are usually hatchery stocks and may not be directly associated with an escapement indicator

stock. An important consideration when comparing results of the escapement and exploitation rate assessments is that the exploitation indicator stocks are predominately fall run-timing stocks; whereas the escapement indicators are more balanced across run timing but the majority have spring or early summer run-timing. Results of the exploitation rate assessments are therefore indicative of trends in fall chinook stocks but are not likely to be representative of trends in all chinook stocks.

Escapement Assessments

1. Average Treaty period escapements increased over pre-treaty periods for 34 (79%) indicator stocks, and decreased for 9 (21%) stocks. The decline in spawning escapements has not been stopped for two groups of stocks: the lower Georgia Strait fall chinook and West Coast Vancouver Island fall chinook.

2. For the 37 indicator stocks with escapement goals, the stocks were assessed to be of the following rebuilding status:

Category	Number of Stocks	% of Indicators
Rebuilding	15	41%
Probably Rebuilding	9	24
Indeterminate	6	16
Probably Not Rebuilding	5	14
Not Rebuilding	2	5
sub-total	37	100%
Indicators without goals	6	
Total	43	

Lower Georgia Strait and the west coast of Vancouver Island fall chinook stocks are considered to be definitely not rebuilding.

3. Stocks with spring and early summer run timing (spawning migrations) have significantly greater increases in average escapements (between Treaty and pre-treaty periods) than later timing stocks. However, progress towards rebuilding did not differ significantly between run timings.

Rebuilding Status	Run timing				
	Springs	Spr./ Summer	Summers	Sum./ Falls	Falls
Rebuilding	6	4	2	1	2
Probably rebuilding	3	3	0	1	2
Indeterminate	2	0	1	2	1
Probably not rebuilding	3	0	2	0	0
Not rebuilding	0	0	0	0	2
	14	7	5	9	7

Exploitation Rate Assessments

This analysis is based on 10 exploitation rate indicator stocks, all of which are hatchery stocks and 9 of which are fall run-type chinook.

4. Fishery Indices: Changes in fishery indices from 1986 to 1987 show either no change or an increase for all fisheries except the North/Central B.C. troll. This may indicate that for fall type stocks represented in this analysis, initial reductions in harvest rates obtained when ceilings were imposed in 1985 have been partially lost due to fishery restructuring, increased incidental mortalities, or abundance changes. Estimates of incidental mortalities have been incorporated in the analyses. The average 1985 - 87 fishery index does not show any reduction in the Southeast Alaska or west coast Vancouver Island troll fisheries. The average fishery index decreased for the combined Georgia Strait troll and sport fishery, but remain above target levels. The declining catches in the Strait of Georgia are primarily the result of declining stock abundance, not harvest rate reductions.

   Overall results of the exploitation rate analysis appear consistent with the escapement analysis which indicates a greater escapement response in early run timing stocks than for fall stocks.

5. Stock Indices: Ocean exploitation rates have declined in four of the exploitation rate indicator stocks but not in the six others. These "Stock Indices" declined for the Willamette springs, Spring Creek, Cowlitz, and Quinsam fall chinook stocks. Five indicator stocks (Big Qualicum, Robertson Creek, Columbia River Brights, Bonneville, and Stayton Pond) exhibited small but variable reductions in ocean exploitation rates of age 3 fish, but increased exploitation of age 4 fish. The tenth indicator stock, Capilano, also shows an increased exploitation rate but uncertainty about recent escapements to this stock confounds our interpretation of ocean exploitation.

6. Brood Year Exploitation Rates: This year (1987) is the first year that a complete brood has returned which was fished entirely under PSC management regimes. Of the ten indicator stocks, 5 show declines in brood exploitation rates, and 5 show no change or increases relative to the previous brood year.

Exploitation Rate Indicator Stocks
Change in Brood Year Index

Increase	Decrease
Big Qualicum	Quinsam
Robertson Creek	Spring Creek
Columbia River upriver Bright	Cowlitz
Willamette Spring	Stayton Pond Tule
(Capilano *)	Bonneville Tule

* see note in no. 5 above.

7. Survival and Contribution Indices: Substantial abundance changes have occurred for some chinook stocks due to changes in survival rates or enhancement levels. Abundance has increased for some stocks and decreased for others, but lack of information on all stocks precludes estimation of combined abundance changes. For example, Columbia River bright stocks have increased and are currently supporting large portions of the catches in some ocean fisheries. However, contributions from Robertson Creek and Spring Creek hatchery stocks have decreased substantially in recent years, and survival of some other hatchery stocks are known to be depressed (Appendix II).

Other Conclusions

8. Incidental mortalities of chinook salmon continue to be a problem and are increasing. The 1987 size limit increase in the outside Canadian troll fisheries has increased incidental mortalities of sub-legal sized chinook and resulted in increased exploitation rates on age 4 and older chinooks in the west coast of Vancouver Island troll fishery. Increased exploitation rates on older chinook were not detected in the North and Central B.C. troll fisheries because the contribution of age 3 chinook to these fisheries was limited even before the size limit change. Impacts of chinook non-retention fisheries have increased since Treaty implementation. The fishery exploitation index based on total mortalities (including non-retention mortalities) in the S.E. Alaska troll fishery has increased relative to the base period. The same index based on reported catch only showed a small decrease relative to the base period. It is not possible to quantify impacts of incidental mortalities for each escapement indicator stock, but analyses of the exploitation rate indicators imply that incidental mortalities have slowed the rebuilding rate for stocks represented by these indicators.

9. The Committee deferred a full examination of pass-through pending clarification from the Commission. However, from this report, some information is available on pass-through. Terminal run and spawning escapement data for most of the escapement indicator stocks are presented in Appendix I, Supplement A. The current exploitation rate analyses indicate that Washington/Oregon ocean exploitation rates on fall indicator stocks have been below the base period level during the Treaty period.

CHINOOK TECHNICAL COMMITTEE RECOMMENDATIONS

1. Exploitation rates on lower Georgia Strait and West Coast Vancouver Island fall chinook stocks should be reduced to begin rebuilding. Some changes in management regimes and/or rehabilitative enhancement are required to begin rebuilding these stocks.

2. The potential for restructuring mixed stock fisheries to more evenly distribute harvest across the various run-types of stocks should be explored. Analysis of options should consider both benefits and possible adverse side effects such as increased incidental mortalities which might result from such restructuring.

3. Management measures should be implemented to reduce or compensate for incidental chinook salmon mortalities on a coastwide basis.

4. A complete assessment of cumulative pass-through impacts on rebuilding progress is needed to complete the Commission's rebuilding assessment. Policy questions and information needs for interpretation of the pass-through provision should be resolved.

5. The Committee recommends attention to the following information concerns and needs:

   a) An increased commitment to conduct consistent escapement surveys to obtain better escapement enumeration, including sex ratio and age composition data needed for evaluation of rebuilding. Simply estimating the number of chinook is not adequate to evaluate effects of management actions or to determine chinook productivity.

   b) Indicator stock programs should be reviewed to determine if representation of production regions and stock type is adequate. The Committee is especially concerned with representation of spring and spring/summer run-timings.

   c) Changes in spatial and temporal fishery patterns have affected fishing effort and perhaps chinook encounter rates. Troll fisheries and CNR periods should be resampled in order to assess these impacts, check previous data, and verify parameters in the induced mortality assessments.

   d) Consistent and standardized recovery programs for coded-wire tagged fish at hatcheries and on spawning grounds are required. In addition, consistent methods need to be used time of release from hatchery programs.

6. Policy questions of what constitutes rebuilding must be resolved before the Committee can complete its assessment of rebuilding.

CATCH AND ESCAPEMENT IN 1987

Review of Fisheries with Harvest Ceilings -established by the Pacific Salmon Commission (PSC)

Southeast Alaska Fisheries: The preliminary 1987 catch by all Southeast Alaska fisheries was 282,000 chinook salmon. This exceeded by 3,000 fish, or 1.1 percent, the total 1987 all-gear catch ceiling of 279,000 which consisted of 263,000 base catch ceiling plus an Alaska hatchery addon of 16,000 chinook. Chinook catch by gear type was troll - 242,300 (85.9%); net - 15,400 (5.5%); recreational - 24,300 (8.6%). The troll chinook harvest occurred as follows: winter season - 28,400 (12%); June experimental hatchery - 4,400 (2%); summer season - 209,500 (86%). At 23 days, the 1987 summer troll chinook season (June 20 - July 12) was the shortest on record. Five outer coastal areas of high chinook abundance were closed July 4 - 12 to slow the chinook catch rate; however, a July 13 closure was still necessary. Chinook non-retention during the remainder of the summer troll season, July 13 - August 2 and August 13 - September 20, was monitored by onboard observers. Incidental chinook catches by net fisheries declined in 1987 primarily due to reduction of purse seine fishing time for pink salmon conservation. Chinook non-retention during the early portion of the purse seine fishery was monitored through port sampling and a logbook program. Chinook salmon catches in recreational fisheries were similar to recent years. Transboundary chinook catches are included in the all gear catch statistics. There was no change in fishery regimes as a result of expiration of the Transboundary Chapter.

Canadian Fisheries

The minimum size limit for troll fisheries in all areas except the Strait of Georgia was increased from 62 to 67 cm fork length. Catch statistics for commercial fisheries represent sales slip data accumulated through June, 1988. Only minor revisions would be expected beyond this time.

North/Central British Columbia: The 1987 chinook catch ceiling for the combined North/Central B.C. fisheries (troll, net and sport) was 263,000. Chinook catch was 282,960 (7.6% above the ceiling). This is at the limit of the 7.5% management range, about the catch ceiling, established by the Commission.

The troll fishery opened for all species on July 1 and was managed by closing portions of the west coast of the Queen Charlotte Islands and of Areas 6, 7 and 10 when target ("red line") levels were exceeded. Red line areas closed for all species on August 18, with the entire north/central troll fishery closing for the retention of chinook on August 30 and for all species on September 8. Chinook non-retention fisheries totaled 9 days in north/central areas not managed through red line closures. Non-retention periods were not sampled for catch-release rates. The chinook catch was 239,700.

Net fisheries north of Vancouver Island harvested chinook incidentally during fisheries directed at sockeye, pink and chum. Most net fisheries were curtailed due to poor sockeye returns; however, increased fishing time in Areas 3 and 4 occurred due to above average pink returns. Chinook catch in Areas 1 - 10 was 29,300.

Most ocean sport fishery catches north of Vancouver Island were estimated by local field staff without a formalized creel census. Chinook catch was estimated to be 14,000.

West Coast Vancouver Island Troll: The 1987 catch ceiling for this fishery was 360,000. The fishery opened for chinook on July 1 and was managed through area closures to Swiftsure Bank (off Juan de Fuca Strait) and Big Bank (off Barkley Sound). Closures were intended to slow the catch. The fishery was closed for the retention of chinook on August 16 and for all species on August 23. Chinook non-retention fisheries (CNR) totaled 7 days. CNR periods were not sampled for catch-release rates. The chinook catch was 378,900.

Georgia Strait: The 1987 combined catch ceiling for the Strait of Georgia (troll and sport) was 275,000. Chinook catch, based upon accumulated sales slips for troll fisheries and a creel survey for the sport fishery, was 159,695. The troll fishery opened for chinook on July 1 and continued through September 30. Chinook non-retention fisheries did not occur in 1987. The chinook catch was 38,695. Annual chinook catch, as measured by the Strait of Georgia Creel Survey, was estimated to be 121,000. Sport effort in the Strait was similar to recent years.

Review of Other Fisheries

Available catch statistics for fisheries of interest to PSC, but not managed under PSC harvest ceilings are presented in Table 1. We have prepared the narratives below to describe the general 1987 fishery status for the major fisheries without ceilings of concern to PSC chinook management.

Canadian Commercial Net Fisheries

Transboundary Rivers: Commercial gill net catch of chinook in the Canadian portions of the Transboundary rivers are: Taku River - 127 chinook adults and 106 jacks; Stikine River - 1,018 chinook adults and 263 jacks.

Johnstone Strait (Areas 11 - 13): The 1987 chinook catch of 13,900 is the lowest since 1957.

Georgia Strait/Fraser River: The 1987 chinook catch was 13,000 of which 11,155 chinook were taken in the Fraser River gillnet fishery. The Fraser River catch was the lowest on record.

Juan de Fuca Strait: The 1987 chinook catch of 6,800 was the

lowest since 1983.

Barkley Sound: The 1987 chinook catch of 200 occurred entirely as incidental catch during very limited sockeye fishing.

Canadian Sport Fisheries

Tidal: A number of tidal sport fisheries occur on the west coast of Vancouver Island and in upper Johnstone Strait; however, only the fishery off the west coast of Vancouver Island (primarily Barkley Sound) was assessed for catch. The 1987 chinook catch for Barkley Sound (July through September), estimated by a creel survey, was 31,800.

Non-tidal: Nontidal sport fisheries exist in most major B.C. rivers, including the Skeena, Nass, Kitimat, Bella Coola, Somass and Fraser rivers and various streams on the east coast of Vancouver Island. In northern B.C. rivers (areas 1-10), the 1987 chinook catch was estimated by field staff at 5,000 including jack chinooks. Most of this catch occurred in the Skeena and Atnarko rivers. In the Fraser River, chinook fisheries occurred in eight areas (Bowron, Quesnel, Bridge, Clearwater, Shuswap, South Thompson, Vedder-Chilliwack and Lower Fraser rivers). Chinook catch, estimated by creel surveys and interviews by fishery officers, was 4,990 chinook adults and 2,223 jacks; 1,800 of the adults were fall chinook taken in the Chilliwack River. A small sport fishery occurs in the upper Alsek River. The reported catch in this fishery was 327 chinook in 1987.

Canadian Indian Food Fisheries

The 1987 chinook catch in the Stikine River was 1,183 adults and 183 jacks. The only other food fishery in the Transboundary rivers occurs in the Alsek River and the reported catch was 125 chinook.

The 1987 food fish catch of chinook in the north/central B.C. was 19,483, well below the 1986 level of 26,423.

The 1987 chinook catch in the Somass River was 12,211, a decrease from the 1986 level of 19,800.

The 1987 chinook catch in the Fraser River was 14,525, less than the 1986 level of 15,600.

Fisheries occur in several rivers draining into the Strait of Georgia. Reported catches from the Cowichan, Nanaimo, and Squamish rivers totaled 720 chinook in 1987.

Puget Sound Fisheries

Sport and commercial net fisheries in Puget Sound continued to be restricted to protect depressed spring chinook stocks. Commercial net catch declined again in 1987, to 158,000 from 229,000 in 1986 and from 204,000 in 1985. Several additional restrictions were

placed upon the Puget Sound sport fishery in 1987. The sport fishery in the Strait of Juan de Fuca was closed on Fridays and a 2 fish bag limit instituted, from July - September. The chinook sport catch in the Straits was 53,000, a declined from the 1986 value of 69,000 and is comparable to the mean 1984 - 86 catch. The bag limit was also reduced to 2 fish in areas 7 and 9. The sport chinook catch in area 7 (San Juan Islands) also declined compared to 1986 and is about 25% below the 1984 - 86 average. The remaining Puget Sound fisheries were managed in the same general manner as in the last several years. With several exceptions, Puget Sound summer/fall type chinook are generally healthy and support varying levels of terminal fisheries.

Washington Coast Fisheries

The northern Washington coastal stocks from the Quillayute, Hoh and Queets Rivers are managed on the basis of escapement floors and terminal exploitation rates. With the exception of the Quillayute summer run, these coastal stocks are not of immediate conservation concern. No directed commercial fisheries were conducted on fall chinook stocks from Grays Harbor. Grays Harbor spring chinook remain a problem; the only terminal harvest of this stock was a small quantity taken by Indian net fisheries on the Chehalis Reservation. The 1987 drought may have substantial negative impacts on this stock.

Columbia River Fisheries

The freshwater sport fishery, including the buoy 10 fishery, harvested approximately 84,000 chinook as compared to 66,000 in 1986. The 1987 Columbia River net fisheries harvested 480,000 chinook, as compared to 283,000 in 1986. A lower river spring gillnet fishery, targeting on surplus lower river spring stocks, harvested 11,600 chinook. Commercial catches of upper Columbia River spring or summer chinook stocks in 1987, incidental to fisheries directed at other species, totaled 300 and 1,000 fish respectively. There were tribal ceremonial and subsistence fisheries on these runs which harvested about 6,400 upriver spring chinook and 300 summer chinook. Commercial chinook fisheries were directed primarily at lower river fall stocks and upriver bright fall stocks. Fall commercial seasons were structured to maximize harvest of surplus upriver brights and lower river tule (hatchery) stocks while providing protection for the depressed Spring Creek Hatchery stock.

Ocean Fisheries North of Cape Falcon

Ocean chinook fisheries off the Washington coast and the Oregon coast north of Cape Falcon, were managed primarily for Columbia River chinook stocks. Far northerly migrating chinook stocks are taken incidentally to harvest directed at Columbia River Tule stocks in this area. In 1987, ocean troll and recreational fisheries were managed under Pacific Fisheries Management Council (PFMC) quotas in response to concerns for continuing depressed Columbia River fall tule chinooks destined for Spring Creek

Hatchery. The total ocean troll harvest was 78,000 chinook. Washington landings were 73,000 chinook while Oregon landings north of Cape Falcon were 5,000 chinook. Ocean recreational fisheries north of Cape Falcon landed 44,000 chinook. These fisheries were also limited by PFMC quotas similar to the troll quotas in that area. Recreational landings in Washington and Oregon, North of Cape Falcon, were 40,000 and 4,000, respectively.

Ocean Fisheries From Cape Falcon To Cape Blanco

The general season ocean fishery between Cape Falcon (Lat. 46N) and the Cape Blanco area (Lat. 43N), denoted as the Central coast, harvests a mixture of southern origin stocks, primarily from the Rogue, Klamath and Central California Valley river basins. Far north migrating stocks in the ocean troll and recreational fisheries in the central coast area are a minor component of the catch and are not reported here. A small, nearshore, fishery occurred off the mouth of the Elk River and harvested 2,923 chinook from the stock aggregate that migrates north into areas under the Pacific Salmon Commission jurisdiction. Estuary and freshwater sport fisheries catch data are incomplete at this time, but the catch is projected to be about 35,000 to 40,000 from north migrating stocks.

Preliminary Review of 1987 Chinook Escapements

We have prepared the following brief narratives to complement the escapement data presented in Table 2.

Southeast Alaska

Natural chinook salmon escapements to Southeast Alaska and the Transboundary rivers in 1987 were generally similar to 1986. Estimates indicate a total 1987 escapement of 50,700 chinook salmon compared to 46,100 in 1986. Escapements increased in 4 of the 11 indicator systems and declined in 7. However, changes were less than 10% of 1986 levels in 6 of the 11 systems. Consistent with recent years, escapements to southern and central Southeast Alaska systems continued to show greatest improvements relative to the 1975-80 base period while northern systems improved less.

Transboundary Rivers

Chinook escapements in 1987 increased over 1986 in two of the six transboundary rivers and declined in four. Percent changes by system were: +415% in the Chilkat River, +116% in the Stikine River, -4% in the Alsek River, -26% in the Taku River, -7% in the Unuk River and -43% in the Chickamin River.

British Columbia

Escapements of indicator stocks in British Columbia continued to be increased over pre-Treaty years, except for stocks in the lower Strait of Georgia and west Coast Vancouver Island. However,

relative to 1986, escapements declined in the Nass River and in some portions of the Fraser River, particularly the Harrison river.

Northern British Columbia (Areas 1,3,and 4): The 1987 Queen Charlotte Island (Area 1) chinook escapement was estimated at 2,000, well above the 1986 escapement of 500 and also above the escapement goal. Nass Area escapements (Area 3) exhibited a decrease in 1987 of 50% from 1986; however, one of the major streams in this system was not assessed in 1987. Skeena stocks remained strong in 1987; escapements were only slightly lower than in 1986, but still above the escapement goal.

Central B.C. Coast (areas 6,8, 9 and 10): Escapements to the Kitimat area (area 6) continued to improve. Escapements to Bella Coola (Area 8) declined by 36% from 1986. Rivers Inlet (area 9) escapements in 1987 were down 36% from 1986. Smith Inlet (area 10) doubled in 1987 over 1986, but remained below the escapement goal.

Southern British Columbia (outside the Fraser River): The 1987 escapement to the upper Strait of Georgia stock group increased substantially from 1986 and met the target escapement goal. Estimates of escapement to this area are, however, quite variable, probably reflecting natural variation in fish returns and problems with visual survey methods.

Escapements to indicator stocks (Squamish, Nanaimo and Cowichan Rivers) in the lower Strait of Georgia continued to be depressed, having declined by 75% since 1984. The aggregate spawning escapement to these rivers in 1987 was 4,100 chinook. Escapements to naturally spawning stocks on the west coast of Vancouver Island (WCVI) declined for the third consecutive year. The aggregated escapement for the 7 WCVI indicator stocks was estimated to be 3,400 chinook in 1987. Escapement indicators for the 3 stock groups in southern B.C. do not include escapements to any of the rivers with major enhancement programs; notably the Campbell, Big Qualicum, and Somass Rivers.

Fraser River: The 1987 escapement to indicator stocks of the spring and summer Fraser River chinook was estimated at 98,580, a decline of 13% from the record 1986 escapement; however, escapement trends were not consistent for all spawning populations. The upper Fraser river and Thompson River stock groups declined by 16% and 19% respectively, while the middle Fraser River group did not change. The largest decline occurred in the fall spawning stock in the Harrison River. The 1987 escapement was estimated to be 78,693, a decline of 52% from the record 1986 value.

Puget Sound

Springs: Escapement to these stocks are still under their escapement goals. Some of the stocks are in perilous condition (e.g. White River springs) while others show a gradual, steady

increase toward meeting spawning objectives (e.g. Skagit River springs). For most of the stocks we have little past information from which to draw an historical perspective and gauge progress. Some rivers still do not have complete methodology for estimating the spring chinook escapements.

Summers and falls: Green River chinook showed a dramatic increase in natural spawners in 1987 although a large fraction of these fish are believed to be hatchery strays from yearling plants that had good survival. The Skagit and Snohomish River runs were slightly below their goals. However, these stocks have been fluctuating around their escapement goals for the past several years and do not seem to be seriously underescaped. The Stillaguamish River run did not meet the escapement objective in 1987, continuing a long-term pattern of chronic under escapement. The Hoko River run, with an escapement estimate of 578 did not meet its escapement goal of 850 for the second year in a row.

Washington Coast

Spring/Summer stocks: Grays Harbor spring chinook escapement in 1987 was well below the escapement objective of 1400 adults. Aside from the 1986 escapement of 1800, this stock has been chronically underescaped for the past decade. The returns to the Quillayute River improved in 1987, but the severe drought conditions resulted in an over harvest due to inaccuracies created in the estimation of run size. The final escapement was well below goal at about the same level as recent years. The remaining coastal spring/summer stocks are managed on the basis of a floor minimum and fixed harvest rate. The Hoh and Queets stocks have all escaped above their floors for the past several years.

Fall stocks: All the 1987 escapements of coastal fall chinook stocks had escapements in 1987 at levels well above the base period. These stocks appear to be exhibiting increasing trends, but with high year to year variability.

Columbia River

Columbia River stocks continued to show a mixed response to rebuilding efforts. Escapement needs for lower river spring chinook stocks (Willamette and Cowlitz) were met. The Bonneville Dam count of 44,400 wild upriver spring chinook adults increased from the 38,000 count in 1986, continuing the previous upward trend. The 84,000 adult escapement goal at Bonneville Dam is equivalent to the magnitude of wild fish in the run when the combined natural and hatchery goal of 120,000 was developed.

The 1987 return of 33,000 adult summer chinook was a 26% increase from the 1986 return of 26,200 and the largest since 1978. However, whether this Bonneville dam count is an accurate portrayal of the true status of summer chinook is in question. Overlapping run timings with increasing stocks of springs and fall stocks may be inflating the counts of summer chinooks.

While the trend of increasing escapements continues, this stock still remains seriously depressed compared to its 85,000 escapement goal.

The count of adult upriver bright fall chinook at McNary Dam was 155,300 fish compared the 1986 count of 113,200 and the escapement goal of 40,000 adults. Sport fisheries and a limited tribal commercial gillnet fishery in the area above McNary Dam harvested a little of this surplus with catches of 4,100 and 2,200, compared to 1986 catches of 5,000 and 1,000, respectively. The upriver bright fall chinook stock has demonstrated dramatic abundance increases in the last few years compared to the record low return in 1981.

The 1987 return to Spring Creek Hatchery, including tule fall chinook trapped at Bonneville Dam as supplemental broodstock, totaled only 2,050 adults compared to 3,300 in 1986 and the escapement goal of 8,200 adults. It is believed that the major reason for the very poor return of the Spring Creek tule stock in 1987 was due to bacterial gill disease at the hatchery during the rearing of the 1984 brood. Escapements to Spring Creek Hatchery return primarily as three year old fish. In addition, annual installation of screens to divert smolt outmigrants away from the turbines and into the bypass system at Bonneville Dam was not completed in time to benefit the prematurely released smolts.

Lower river hatchery tule chinook returned to the Columbia River in record numbers in 1987. Large surpluses were recorded at nearly all Washington and Oregon hatchery facilities.

Oregon Coast

Spawning escapements into the 10 standard survey streams appeared to be strong, as indicated by index counts of the number of live and dead fish on the spawning grounds. Despite unusually low water early in the spawning period, peak counts of spawners later in the season indicated the aggregated stocks of north migrating chinook from coastal Oregon are responding well since the Treaty has been in place. Oregon is in the process of writing a coastal chinook management plan. During the planning process, methods to enumerate the coastal chinook spawning escapement and the escapement goal will be established.

ASSESSMENT OF REBUILDING THROUGH 1987

The Chinook Technical Committee is proceeding with its previously identified approach to assessing rebuilding (Assessing Progress Towards Rebuilding Depressed Chinook Stocks, 2/11/87). During the current phase (first 5 years), the rebuilding analysis is limited to: (1) the examination of the general trends in escapement and comparing the relative changes in mean escapements, and (2) the analysis of exploitation rates. Escapement analyses are presented in Appendix I but are limited, as yet, by the short time frame of escapements (1985-87) affected by management under

the Pacific Salmon Treaty. Exploitation rate analyses are detailed in Appendix II.

Escapement Assessment

In the analysis of the escapement data, we considered whether escapements increased significantly between pre-Treaty (up to and including 1984) and Treaty periods. Two levels of stock groupings were used to assess changes: a) escapements to individual indicator stocks, and b) aggregations of indicator stocks to examine differences in stock size, and run timing. Analyses involved escapement trends and mean escapements before and after the establishment of PSC management since escapement data are normally highly variable and there were only 3 observed data points with which to measure changes.

The escapement statistic used for most stocks in this assessment was the spawning escapement, with the exception of dam counts (which are measured after the major fisheries) used for escapement of the upper Columbia River spring, summer, and fall bright stocks. The use of escapement defined in this manner, as opposed to ocean escapement or return to river, can present interpretation problems. In some terminal areas, significant fishery harvest or conservation actions can influence spawning numbers. Consequently, effects of PSC actions in outside fisheries may be masked in these stocks. Use of other escapement statistics may be considered for future assessments but the definition of terminal area boundaries and catch allocations to escapement indicator stocks could be a formidable task.

While the majority of indicator stock escapements are still below goals, the percentage of indicator stocks meeting escapement goals has increased from 8% in 1982 to 42% in 1987. Early run timing stocks have greater increases in average escapement than do later stocks but overall progress towards rebuilding did not differ significantly between run types.

In determining whether a stock was or was not rebuilding, the Committee decided that a set of evaluation criteria was most appropriate. In the absence of stock-specific rebuilding schedules, a linear trend has been used as a first approximation to the schedule. Details of this evaluation procedure are presented in Appendix I.

Indicator Stocks That Are Rebuilding: A particular stock is considered to be "Rebuilding" if it meets all three criteria and "Probably Rebuilding" if it meets two of the three criteria. If a stock met only one criterion we could not determine its status.

1. An increase in mean escapement occurred between pre-Treaty and Treaty periods (for purposes of this analysis, the pre-Treaty period is considered to be 1979-82, except for Southeast Alaska and Transboundary stocks for which the pre-Treaty period is 1975-80).

2. Escapement during the three Treaty years (1985-87) are on or above a linear rebuilding schedule projected from the average pre-Treaty escapement to the escapement goal in 1998.

3. A positive slope of escapements exists from 1984 to 1987, or from 1980 to 1987 for S.E. Alaskan and Transboundary stocks.

Indicator Stocks That Are Not Rebuilding: A stock is considered to be " Not Rebuilding" if it meets all three of the following criteria and "Probably Not Rebuilding" if it meets two criteria. If a stock met only one criterion, we could not determine its status.

1. A decrease occurred in mean escapements between pre-Treaty and Treaty periods.

2. Escapements during the three Treaty years (1985-87) fell below the linear trend line from the base period to the escapement goal in 1998.

3. A negative slope of escapements occurred from 1984 to 1987, or from 1980 to 1987 for S.E. Alaskan and Transboundary stocks.

Our rebuilding assessment of the 37 indicator stocks with escapement goals, indicates that 15 of the stocks are rebuilding, 2 are classified as not rebuilding, and 20 are of indefinite status. This indefinite class is subdivided into those probably rebuilding (9), those probably not rebuilding (5) and those for which no trend was evident(6).

Stocks rebuilding:

Andrews (spring)
Blossom (spring)
Keta (spring)
Unuk (spring)
Chikamin (spring)
Skeena (spring)
Kitimat (spring)
Columbia Upriver Bright (fall)
Rivers Inlet (summer/fall)
Upper Fraser (spring/summer)
Middle Fraser (spring/summer)
Thompson/Fraser (spring/summer)
Skagit (spring)
Stillaguamish (summer/fall)
Oregon coastal (fall)

Stocks not rebuilding:

Lower Georgia Strait (fall)
West Coast of Vancouver Island (fall)

Stocks probably rebuilding:

King Salmon (spring)
Yakoun (spring)
Bella Coola (spring/summer)
Nass River (spring/summer)
Columbia River (spring)
Green/Duwamish (fall)
Grays Harbor (spring)
Grays Harbor (fall)
Snohomish (summer/fall)

Stocks probably not rebuilding:

Alsek (spring)	Smith Inlet (summer)
Taku (spring)	Quillayute (summer)
Chilkat (spring)	

No rebuilding assessment could be made:

Situk (spring)	Skagit (summer/fall)
Stikine (spring)	Upper Georgia St. (sum./fall)
Lower Fraser (Harrison-fall)	Columbia River (summer)

The Lower Georgia Strait and West Coast of Vancouver Island stocks do not appear to be rebuilding under the current level of PSC ceiling management. This may also be true for several other stocks presently of "Probably Not Rebuilding" or "Indeterminate" status.

Exploitation Rate Assessment

The rebuilding program in the Pacific Salmon Treaty (PST) relies upon the progressive reduction of exploitation rates in fisheries under ceiling management over time. The exploitation rate analysis was developed to provide an early indication of the effects of management changes under the PSC chinook management.

The procedures used for the analysis of the 1987 exploitation rates differed from those employed in previous years in three fundamental ways:

(1) exploitation rates are expressed in terms of adult equivalents;

(2) exploitation rates include estimates of total fishing mortality (i.e. incidental mortality plus reported catch instead of only using coded-wire tags observed in the reported catch);

(3) coded-wire tag data were up-dated through 1987; significant revisions in S.E. Alaskan data resulted in a more complete estimate of coded-wire tag recoveries in the historical database.

A detailed discussion of these and other changes are included in Appendix II.

Exploitation rate analysis begins by creating a time series of age-specific fishery exploitation rates for each exploitation rate indicator stock. Exploitation rates on each stock are expressed as changes from their base period average and then combined to provide a fishery index of changes in exploitation rates across all indicator stocks within the fishery. This index is used as an indirect measure of harvest rate changes in a fishery.

This assessment is based on coded-wire tag recoveries for 10 indicator stocks with a continuous time series of recovery data which began during the base period (1979-1982). These analyses are specific to these stocks; the extrapolation of results to similar stocks and/or generalized statements about fishery impacts will be dependent upon how representative these indicator stocks are of other stocks or upon the stock composition in a fishery. At present, these indicator stocks consist of 4 fall chinook stocks from southern B.C., 5 fall chinook stocks from the Columbia River, and the Willamette spring chinook stock (lower Columbia River). The committee is also beginning to evaluate a S.E. Alaskan spring chinook stock as an exploitation rate indicator. However, complete data for exploitation rate analyses were not available for this stock until the 1983 recovery year.

Fishery Indices

The fishery index measures the relative change in the total mortality of the indicator stocks within a fishery. With the exception of the North/Central troll fishery, exploitation rates for index stocks in fisheries with ceilings have not declined to levels anticipated when fishing regimes were established under the Pacific Salmon Treaty (Table 3). Reasons for the lack of decline will vary between fisheries but are partially due to changes in stock abundances and unanticipated increases in incidental mortalities from size limit changes (both increased shakers and redirected effort onto older aged chinook) and increased periods of chinook non-retention fisheries. Further, large variability is often evident when the indices of several stocks are compared. This variation may be due to differential exploitation rates, and/or departures from assumptions and sampling errors. Concerns for between stock differences are why the committee has attempted to increase the number of exploitation rate indicator stocks. All fishery index changes in the following paragraphs refer to Table 3.

S.E. Alaska Troll Fishery: The average 1985-87 fishery index based on total mortality was 9% greater than the 1979-82 base period. On a yearly basis, the index from 1985-87 was above the base period level for 2 of the 3 years. The average 1985-87 fishery index based only on reported catch was 3% below the base period.

A combination of factors may have contributed to the lack of expected reductions in the fishery index: 1) changes in the structure of the fishing season, principally large reductions in fishing times during the late spring and late summer, smaller reductions in the mid-summer season, and no reductions in the winter fishery; 2) increased catch in the CNR fishery; 3) use of principally fall stocks as indicators which do not provide a complete representation of all stocks in the fishery. The decrease in the S.E. Alaska hatchery stock exploitation rates in the 1985-87 period, compared to 1983-84, suggests that the present conduct of this fishery to achieve the PST ceilings is affecting stocks differentially.

North/Central B.C. Troll Fishery: The reduction in the fishery index appears to be in the range expected under PST ceilings, averaging 22% below base period levels. The 1987 size limit change had little measurable impact in this fishery because very few chinook were landed in the 62 to 67 cm size category prior to the increase in the size limit.

West Coast Vancouver Island Troll Fishery: The combined ages 3 and 4 fishery index did not decrease below base period levels during 1985 or 1986, and increased by 31% above the base period in 1987. The 1987 size limit change had three effects: 1) a large increase in the 4 year old fishery index from 1986 to 1987; 2) a decrease in the total age 3 fishery index from 1986 to 1987; and 3) an increase in the three-year-old proportion of total mortality attributed to incidental mortality. The following combination of reasons may be responsible for the failure of this fishery to meet target reductions in exploitation rate: 1) time and area restructuring of the fishery may have concentrated exploitation on fall stocks; 2) a failure of Spring Creek hatchery stock and fluctuations in abundance of other key fall hatchery stocks; 3) the effect of concentrating harvest on 4 year olds due to the change in size limit has caused an increase in the exploitation rate on 4 year olds (historically, this fishery predominately harvested 3 year old fish).

Georgia Strait Sport and Troll Fisheries: The average 1985-87 fishery index for the combined troll and sport fisheries has decreased 15% since the base period, but remains 32% above target reduction under the initial PST regimes. The exploitation rate for the troll fishery has been substantially reduced. However, the exploitation rate for the sport fishery has increased above base period levels. The results of this analysis indicate that, after an initial drop in 1985, the exploitation rate has returned nearly to base period levels by 1987. Catches have declined in this same period because of declining abundance of available stocks. There is evidence of reduced abundances for the Lower Georgia Strait stock complex (survival rate indices have declined in both major Georgia Strait hatcheries). The reason exploitation rates have returned to near base period levels is because management actions have not compensated for reduced abundances.

Washington/Oregon Troll and Sport Fisheries: The average fishery index for Washington and Oregon (North of Cape Falcon) troll and sport fisheries has decreased substantially from the base period. The 1985-87 fishery index averaged 42% of the base period levels for ages 3 and 4 fish.

Stock Indices

Stock indices are designed to assess the combined effect of all ocean fisheries on fish of a given age from a specific stock. Ocean exploitation rates decreased for four index stocks: Quinsam, Willamette Spring, Spring Creek, and Cowlitz fall.

Reductions in ocean exploitation rates for Spring Creek and Cowlitz fall stocks are due to reductions in impacts of the West Coast of Vancouver Island troll fishery and ocean fisheries off the Washington and Oregon coasts. The principal ocean exploitation of the Quinsam stock occurs in North/Central B.C and S.E. Alaska. In spite of increases in exploitation rate in the Alaska troll fishery, total ocean exploitation on this stock decreased, due to decreased impact of the North/Central B.C. troll fishery and possibly in the coastal B.C. net fisheries.

Five index stocks (Big Qualicum, Robertson Creek, Columbia River Upriver Bright, Bonneville, and Stayton Pond) exhibited small but variable reductions in ocean exploitation rates of age 3 fish, but increased in ocean exploitation rates of age 4 fish. Reductions in the three-year-old ocean exploitation index for Bonneville and Stayton Pond are due predominately to reductions in the Washington/Oregon ocean fisheries. Capilano is the tenth indicator stock but the trend in this index is uncertain. Spawning escapements in recent years have been very poor but are thought to be related to the extremely low flow in the Capilano River and poor recent survivals of this hatchery stock.

Brood Year Exploitation Rates

Brood year exploitation rates are designed to monitor the cumulative impacts of ocean fisheries over the life span of offspring from a single spawning year (i.e., a cohort).

Brood year ocean exploitation rates have declined for five stocks (Quinsam, Spring Creek, Cowlitz Fall,, Bonneville Tule, and Stayton Pond Tule) relative to the previous complete brood year. The decline in the Quinsam stock is due to a decrease in North/Central B.C. troll fishery exploitation and a possible decline in B. C. net fisheries. For the four other stocks in this group, declines in ocean exploitation rates are due to reductions in impacts of fisheries off the Washington and Oregon coasts. Rates remained relatively unchanged for three stocks (Big Qualicum, Columbia River Upriver Bright, and Willamette Spring). Rates for the Capilano and Robertson Creek stocks have increased under PST management regimes. The responses may be confounded by changes in collection of escapement data in recent years, particularly in Capilano.

Survival Rate Indices

Survival rate indices (defined as the age 3 catch and escapement divided by the total release size per brood year) indicate that substantial changes have occurred during recent years. For some stocks, increases in abundance can be traced directly to increases in survival rather than reductions in exploitation rates.

Survival rate indices for four Columbia River stocks (Upriver Bright, Cowlitz Tule, Bonneville Tule, and Stayton Pond Tule) have increased substantially. Survival rate indices for the

Upriver Bright stock have increased substantially since 1981; the survival rate of the 1983-84 broods for the Cowlitz fall stock are far above average levels; survival rate indices for the Bonneville and Stayton Pond tule stocks indicate a dramatic increase for the 1984 brood.

Survival rate indices for Robertson Creek, Big Qualicum, Capilano, and Spring Creek stocks have declined substantially. No trend is apparent for survival rate indices for two stocks (Quinsam and Willamatte Spring).

Stock Contribution Indices

The results of the analyses in this report indicate that the ocean exploitation rates on Columbia River Brights did not decrease in spite of large increases in stock abundance. This result can be caused by dramatic decreases in abundance of other stocks which historically contributed substantially to a fishery. Time series of contributions of certain major indicator stocks to some ocean fisheries was estimated to investigate changes in relative stock compositions. The contribution of Columbia Upriver Brights to the outside troll fisheries with ceilings has increased dramatically since the implementation of the PST. However, the contribution of Robertson Creek and Spring Creek hatchery fish to the same fisheries and time periods has decreased substantially. These data suggest that increased contributions of Upriver Brights are probably compensating for decreased contributions of other stocks in these fisheries. It appears that the Upriver Bright stock is presently the largest single contributor to the outside troll fisheries.

DISCUSSION

It is important to consider both the exploitation rate analysis and the escapement analysis when trying to determine the current status of rebuilding. They each have their own strengths and weaknesses, as discussed in the following qualifications section. But when considered together, they provide a first assessment of progress towards chinook rebuilding.

It may appear that some results of the exploitation rate and escapement analyses are inconsistent. While fishery exploitation rates for fall-type indicator stocks have not declined as expected, many escapement indicator stocks are rebuilding anyway. We have identified several possible explanations which may be contributing to these differences. Substantial variation in survival rates and stock abundance of individual stocks maybe producing different stock compositions in fisheries than in the base period. Run types, i.e. springs versus falls, appear to be differentially available to certain major fisheries. This could be explained by the concentration of fisheries into short time periods. Target exploitation rate reductions, for some fisheries with fixed catch ceilings, have not been met partially due to unanticipated increases in mortalities due to size limit changes

and increased chinook non-retention periods. For some stocks, differences in terminal management may be masking the true stock response from PSC management. In some cases, we only have the capability of looking at spawning escapement and cannot assess the escapement from PSC fisheries.

As discussed above, we are now able to incorporate estimates of incidental mortalities into our exploitation rate analyses. These mortality estimates are fishery specific and apply equally across the indicator stocks in proportion to their relative catches. It is our opinion that new sources of incidental mortality are adversely impacting the rebuilding rate. However, because of differential fishery impacts among stocks it is impossible to quantify the impact of incidental mortalities on each escapement indicator stock.

Discussion by Rebuilding Category

Stocks That Are Rebuilding: The stocks that are rebuilding are generally spring and early summer returning stocks that leave the ocean in the early summer prior to current summer fisheries. We would expect to see reductions in the ocean exploitation rates for these stocks, but these are the stocks for which the coded-wire tag data are inadequate. Some other stocks in this category are likely rebuilding due to other factors. For example, the Stillaguamish summer/fall stock is receiving substantive benefit at the expense of terminal fisheries which have been completely closed for several years. Another example is the dramatic increase in the Upper Columbia River Bright fall chinook stock. The ocean exploitation rates on this stock did not decline during the Treaty period. There were, however, several successive brood years with substantially increased survival rates.

Stocks That Are Probably Rebuilding: The stocks in this category exhibited improved escapements but variability in responses precluded categorizing them as definitely rebuilding. Six of the nine stocks are spring and summer stocks. Five of these 9 stocks have had confounding changes in terminal area management or potential escapement enumeration errors which complicate interpretation of the changes observed in escapement levels.

Stocks of Indeterminate Status: These stocks are characterized by relatively high variability in escapements, which confused the interpretation and precludes determining their rebuilding status.

Stocks Probably Not Rebuilding: Five stocks are included in this category, some of which have confounding management problems. For example, the Quillayute River summers have showed increasing abundance returning to the river. However, in 1987, management errors, related to very low river flow, lead to an over harvest of the run. Thus, the ensuing escapement was below the goal and at about the same level as 1985 and 1986. Another example is the Smith Inlet stock which is minimally impacted in local terminal fisheries, but its late run timing (August) suggests it maybe impacted heavily in outside troll fisheries.

Stocks Not Rebuilding: The West Coast Vancouver Island and Lower Georgia Strait stocks are not rebuilding. The escapements are in a declining trend during the Treaty period. In some major fisheries harvesting these stocks, the exploitation rates went up for the indicator stocks. The brood year analysis also shows that the exploitation rates on these stocks has not declined as anticipated. Both of these stocks may also be experiencing decreased survival rates. In Georgia Strait, the exploitation rates in the troll fishery declined to near expected levels, but the sport fishery exploitation rates increased, even in the face of substantially lower catches. This implies that the overall chinook abundance has declined in the Strait of Georgia. For the west coast of Vancouver Island stock, the escapement has decreased since 1982, despite stable exploitation rates in the indicator stock (Robertson Creek), suggesting that decreased marine survival may be associated with this stock. Further, there has also been recent decreases in the survival of their Robertson Creek indicator stock.

Stocks Without Goals: Six chinook stocks originating in Washington State do not have fixed escapement goals due to uncertainties regarding productivity. Terminal run sizes of these stocks have increased since the inception of the rebuilding program.

Qualifications

1. With only three years of observations under full Pacific Salmon Commission management, plus high variability in fishery and escapement data, conclusions regarding rebuilding status should be viewed cautiously.

2. The exploitation rate analysis used a 30% shaker mortality rate in troll and sport fisheries. This rate is in the 20-30% range previously stated by this committee and is the most conservative value, within the range, for estimating mortality impacts on rebuilding. Other rates within this range would not affect the general conclusions regarding rebuilding or the impacts being caused by incidental mortalities.

3. Most agencies have not yet begun to collect age and sex information from natural spawning populations. Major changes in these parameters have been observed for some stocks. Observing only the number of spawners may be inadequate to assess rebuilding.

4. The exploitation rate analysis is limited by the lack of spring and summer run type stocks in the exploitation rate stocks.

5. Changing fishing patterns can confound interpretation of total exploitation rate analyses; monitoring programs are essential to up-date information used to evaluate incidental mortalities and parameters used in the committee's models.

TABLE 1. Preliminary 1987 chinook catches from stocks contributing to U.S./Canada Pacific Salmon Treaty areas, compared with 1984-86 (numbers of fish in 1,000's).

12-Oct-88 - PRELIMINARY DATA

	TROLL				NET				SPORT				TOTAL			
AREA	1987	1986	1985	1984	1987	1986	1985	1984	1987	1986	1985	1984	1987	1986	1985	1984
S.E. ALASKA a/	242	236	217	236	15	22	36	32	24	21	25	22	281	279	278	290
BRITISH COLUMBIA						b/				c/						
North/Cent. Coast	240	202	215	254	29	47	51	36	14	12	9	20	283	261	275	310
W. Vanc. Island	379	342	358	460	0.5	3.3	11	44	d/ 32	13	14	44	412	358	383	548
Georgia Strait/Fraser	38	44	52	88	13	32	31	20	e/ 121	182	235	369	172	258	318	477
Johnstone Strait	2	4	5	9	14	18	38	18	10	10	10	10	26	32	53	37
Juan de Fuca Strait	0	0	0.4	0.3	7	18	17	6	e/				7	18	17	6
sub-total	659	592	630	811	63	118	148	124	177	217	268	443	900	927	1,046	1,378
WASHINGTON										f/						
Strait (marine) g/	45	30	13	16	11	19	13	12	h/ 53	69	44	48	109	118	70	76
San Juans (marine)	0	0	0	0	29	21	33	33	h/ 14	17	13	26	43	38	46	59
Other PS (mar. + fw.)	0	0	0	0	124	151	180	178	h/ 59	88	93	104	183	239	273	282
Coast	73	46	48	12	54	28	25	16	40	24	31	16	167	98	104	44
sub-total	118	76	61	28	218	219	251	239	166	198	181	194	502	493	493	461
COLUMBIA RIVER	-	-	-	- i/	480	283	151	128	j/ 84	66	48	56	564	349	199	184
OREGON																
N. Cape Falcon	5	6	5	9	-	-	-	-	4	2	4	0	9	8	9	9
Central Coast l/	3	2	3	3	-	-	-	-	k/ NA	35	30	29	43	37	33	32
sub-total	8	8	8	12	-	-	-	-	44	37	34	29	52	45	42	41
GRAND TOTAL	1027	912	916	1087	776	642	586	523	495	539	556	744	2,298	2,093	2,058	2,354

a/ Southeast Alaska troll chinook catches shown for Oct. 1- Sept. 30 catch counting year.
b/ British Columbia net catches includes only fish over 5 lb. round weight. Native food fishery catches are not included.
c/ Sport catches are for tidal waters only, catch updates will be provided as available.
d/ Estimates of tidal sport catches are from creel surveys in Barkley Sound only. Survey times and areas may vary from year to year.
e/ Georgia Strait sport catches include Juan de Fuca Strait sport catches.
f/ Coastal and Puget Sound sport catches include marine and freshwater catches, but only adults in freshwater.
g/ Includes areas 5, 6c and area 4B troll catches outside of the PFMC management period (May - September) in the Juan de Fuca Strait total.
h/ Adjusted for punch card bias by multiplying punch card estimate by 0.833
This bias adjustment methodology is currently under review and may result in future adjustment to these numbers.
i/ Columbia River net catches include Oregon, Washington and treaty catches, but not treaty ceremonial.
j/ Columbia River sport catches include adults only, for Washington, Oregon, Idaho and Buoy 10 anglers.
k/ Estuary and inland sport catch data are still preliminary for 1986 and 1987.
l/ Includes only special late season ocean troll catch off Elk River in the Cape Blanco area.

Table 2. Summary of the escapement of Escapement Indicator Stocks, 1985 thru 1987. (1987 data are preliminary).

12-Oct-88

Production Unit	Stock Type	Avg. Esc. Base 1/	Esc. Goal	1985 Esc.	1986 Esc.	1987 Esc.	1986-87 % Base	1986-87 % Goal
Southeast Alaska								
Situk	Spring	1,557	2,100	1,521	2,067	1,884	127	94
King Salmon	Spring	95	250	146	249	228	251	95
Andrews Creek	Spring	371	750	510	1,131	1,042	293	145
Blossom	Spring	165	1,300	1,134	2,045	2,158	1274	162
Keta	Spring	407	800	998	1,104	1,229	286	146
Transboundary Rivers Not Addressed in Treaty Annexes								
Chilkat (U.S.)	Spring	213	2,000	625	170	875	246	26
Unuk (U.S.)	Spring	1,283	2,900	1,862	3,402	3,157	256	113
Chickamin (U.S.)	Spring	344	1,400	1,531	2,683	1,560	616	152
Transboundary Rivers Addressed in Treaty Annexes								
Alsek (U.S.)	Spring	4,501	5,000	2,227	4,231	4,086	92	83
Alsek (Canada)	Spring	5,780	12,500	2,900	5,400	5,200	92	42
Taku (U.S.)	Spring	7,978	25,600	10,851	12,178	8,951	132	41
Taku (Canada)	Spring	9,967	30,000	13,600	15,200	11,200	132	44
Stikine (U.S.)	Spring	6,224	13,700	10,227	8,026	17,318	204	92
Stikine (Canada)	Spring	8,283	25,000	13,600	10,700	23,000	203	67
B.C. North Coast								
Yakoun River	Spr./Sum	788	1576	1500	500	2000	159	79
Nass area	Spr./Sum	7944	15888	8002	17390	8695	164	82
Skeena area	Spr./Sum	20883	41766	53599	59968	59120	285	143
B.C. Central Coast								
Kitimat/Butedale	Summer	7111	14222	8679	11493	22766	241	120
Bella Coola	Summer	8775	17550	32110	25062	15956	234	117
Rivers Inlet	Summer	2475	4950	3371	7623	5239	260	130
Smith Inlet	Summer	1055	2110	230	532	1050	75	37
West Coast Vancouver Island								
Indicator Stocks	Fall	5814	11628	4900	4560	3370	68	34
Fraser River								
Upper River	Spring	12229	24458	34527	41207	34520	310	155
Middle River	Spr./Sum	9216	21133	17595	27349	27330	297	129
Thompson River	Summer	22059	55714	39997	45130	36730	186	73
Harrison River	Fall	116791	233582	147620	162393	78693	103	52
Georgia Strait								
Upper 2/	Fall	2,662	5,325	4,600	1,500	5,000	122	61
Lower	Fall	11,389	22,778	5,400	3,620	4,070	34	17

Table 2. (Continued)

Production Unit	Stock Type	Avg. Esc. Base 1/	Esc. Goal	1985 Esc.	1986 Esc.	1987 Esc.	1986-87 % Base	1986-87 % Goal
Puget Sound								
Skagit	Spring	1,217	3,000	3,265	1,995	2,108	169	68
Skagit	Summer	13,265	14,900	16,298	18,127	9,647	105	93
Stillaguamish	Summer	817	2,000	1,409	1,230	1,400	161	66
Snohomish	Summer	5,028	5,250	6,342	4,443	4,904	93	89
Green	Fall	5,723	5,800	2,908	4,792	10,338	132	130
Dungeness 3/	Spring	N/A	N/A	N/A	195	93	N/A	N/A
Nooksack 3/	Spring	N/A	4,000	810	1,200	600	N/A	23
White 3/	Spring	N/A	N/A	N/A	N/A	105	N/A	N/A
Skokomish 3/	Spring	N/A	N/A	N/A	0	N/A	N/A	N/A
Hoko 3/	Fall	N/A	850	N/A	800	578	N/A	N/A
Dungeness 3/	Fall	N/A	400	N/A	39	N/A	N/A	N/A
Washington Coast								
Hoh	Spr/Summer	1,325	NA 4/	1,000	1,500	1,700	121	NA 4/
Queets	Spring	925	NA 4/	700	900	600	81	NA 4/
Grays Harbor	Spring	450	1,400	1,200	1,800	800	289	93
Grays Harbor	Fall	8,575	14,600	9,500	10,500	18,800	171	100
Quillayute	Summer	1,250	1,500	600	600	700	52	43
Quillayute	Fall	5,850	NA 4/	5,500	10,000	12,400	191	NA 4/
Hoh	Fall	2,875	NA 4/	1,700	5,000	4,000	157	NA 4/
Queets	Fall	3,875	NA 4/	3,900	7,700	6,000	179	NA 4/
Columbia River								
Upper River 5/	Spring	28,955	84,000	28,300	39,000	44,400	144	50
Upper River	Summer	24,275	85,000	23,400	25,900	33,000	121	35
Lewis River 5/	Fall	11,801	10,000	7,500	14,500	11,200	109	129
Upriver Bright 6/	Fall	28,325	40,000	93,300	113,200	155,300	474	336
Oregon Coast								
Aggregate Index 7/	Fall	91	N/A	133	121	131	138	N/A

1/ Base period for Alaskan and Transboundary stocks 1975-80; base for all other stocks 1979-82.
2/ 1986 escapement estimate for Upper Georgia Strait reflects unusual survey conditions.
3/ Little or no comparative data are available for these stocks.
4/ Stocks managed on the basis of floor minimum and fixed harvest rates.
5/ Only includes naturally spawning component.
6/ The count reported for 1987 is only through October 15 at McNary Dam.
7/ Oregon coastal north-migrating chinook stocks are presently assessed by spawning escapement surveys. Historically these surveys were limited and conducted at 10 standard sites in 10 river basins. Escapements are expressed as peak (maximum) number of fish per mile seen on a single occasion among several surveys during the spawning period. Peak counts from ten river basins are aggregated to yield an estimate average escapement index for all 20 north migrating stocks.

Table 3. Fishery indices (based on 10 indicator stocks) relative to the 1979-82 base period and the target reductions established under the initial PST fishery regimes. All calculations, except as noted, based on total fishing mortalities.

Fishery	Age	Total Mortalities 1985	1986	1987	85-87 Avg	Reported Catch 85-87 Avg	Target Reduction (1)
Southeast Alaska Troll	4 & 5	14%	-6%	19%	9%	-3%	-22%
North/Central Troll	4 & 5	-31%	-11%	-24%	-22%	-23%	-16%
WCVI Troll	3	-7%	17%	-13%	-1%	-7%	-24%
WCVI Troll	4	-1%	-7%	78%	23%	22%	-24%
WCVI Troll	3 & 4	-4%	3%	31%	10%	7%	-24%
Georgia Str. Sport & Troll	3 & 4	-33%	-5%	-8%	-15%	-17%	-47%
Georgia Strait Troll	3 & 4	-82%	-62%	-64%	-69%	-74%	-79%
Georgia Strait Sport	3 & 4	-2%	31%	26%	18%	18%	-20%
WA/OR Ocean Tr & Spt	3	-26%	-31%	-18%	-25%	-24%	(1)
WA/OR Ocean Tr & Spt	4	-80%	-59%	-68%	-69%	-69%	(1)
WA/OR Ocean Tr & Spt	3 & 4	-48%	-42%	-35%	-42%	-42%	(1)

Notes: (1) Target reductions are initial reductions from the 1979-82 base period expected from the rebuilding program. There were no target reductions established for the Washington/Oregon troll and sport fisheries.

(2) Indicator stocks used are as follows:
Lower Georgia Strait: Big Qualicum (fall), Capilano (fall)
Upper Georgia Strait: Quinsam (fall)
W. Coast Vancouver Island: Robertson Creek (fall)
Columbia River: Upriver Brights (fall), Willamette (spring), Spring Cr (fall), Cowlitz (fall), Bonneville Hatchery (fall), Stayton Ponds (fall)